MSR

MOUNTAIN SAFETY RESEARCH

NEWSLETTER

MSR

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Acute Mountain Sickness

MSR Climbing Club studied salt and water needs on four climbs on Success Cleaver (Mt. Rainier) last summer. Using chemical tests, we quickly discovered our deficiency was water, not salt.

The need to avoid dehydration has been stated in the literature before, but there doesn't appear to be a theory connecting dehydration directly with acute mountain sickness (AMS) and high-altitude pulmonary edema (HAPE). We've thought up a mechanism based on Bernoulli's Principle, osmosis and reverse osmosis. This theory explains a proposal by Dr. William Gillen, diving physiologist, that HAPE can be reversed by supplying low-pressure air to the sick climber to drive the fluid out of the lung alveoli back into the capillaries where it came from.

We have devised a lightweight low-pressure air source (a large bivouac sack filled with air, with some one sitting on it) and will try it this summer. During one week, we will have a medical study team in the crater on Rainier to examine ill climbers when and where they are sick, and will try the low-pressure breathing air system on those who wish to participate.

This is an all-volunteer effort. All medical work will be done by climbing doctors, but we will need about ten climbing Sherpas who will conduct the doctors up and down the glacier as needed, build igloos and set up tents, carry equipment and food, keep records, man the radios, and supervise the voluntary exercise tolerance test at Camp Muir. Volunteers should be experienced climbers and have a background of interest in rescue, first aid, or safety matters.

Permission has been obtained from the Park Service. They are concerned about the considerable number of climbers who become ill on Mt. Rainier; they hope we can find a remedy.

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For immediate advice, Rainier climbers should drink enough water to maintain a urinary output of 1000 ml (one quart) per day. It is expected that an intake of 4-6 quarts will be required. If there is really profuse sweating and you are not acclimatized to strenuous exercise, take a waxed salt tablet with each full cup or pint of water. Don't climb faster than your oxygen intake will allow with reasonable comfort.

Testing of Stoves

Ever since last summer on Success Cleaver (Mt. Rainier) when we were learning the urgency of the need to supply sufficient water to climbers, we have been studying back-packing stoves. We have tested twelve different kinds and have talked with many climbers to learn their experience. The results are quite a mixture.

Off Belay magazine published on lightweight stoves in the December '72 issue. The article is worth reading. Send $1.00 to Off Belay for a copy (12416-R 169th SE, Renton, WA 98055). Better yet, subscribe and start with the December issue. But Part One doesn't tell you all you need to know about the stoves, and Part Two on the problems of stove operation will not appear until October.

Here is a checklist of the criteria for a good stove.

1. Sufficient Heat Output. The fundamental purpose of carrying a stove is to burn fuel to get heat. If the heating rate is not sufficient, the basic purpose will not have been accomplished. In the Off Belay stove performance tests, many of the stoves took 8 to 12 minutes to bring a quart of water to boiling in a laboratory environment. The same time would be required to melt snow. When these stoves were tested under windy conditions and cold conditions, the times became much longer, even double. If you need 5 quarts of water a day on a snow climb, you can see how long it will take on the poorer stoves.

The following table, taken from manufacturers data and our tests, gives the fuel burning rates all in ounces weight per hr. Multiply by 4/3 to get fluid oz.

MSR Model 9	- 9.0	Baby Enders 303	- 4.0
Optimus 111B	- 6.0	Svea 123	- 4.0
Primus 210L	- 6.0	Bleuet	- 3.5
Optimus 80	- 4.8	Optimus 8R & 99	- 3.3
Gerry Mini	- 4.0	Primus 96L	- 3.0

2. Reliability. The second fundamental is that the stove must work well every time. The reports vary widely from "no trouble for years" to "both stoves failed and we had no hot food or melted water that night." The problem stoves were mostly the self-pressured types, both gasoline and butane (LPG). Tank temperature is critical and there is sometimes clogging of the jets.

The recent disaster on Aconcagua may have been aggravated by the failure of their stove. The

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climbers could not melt snow at high bivouac and became severely dehydrated.

3. Speed of Lighting. Speed of lighting is a convenience. Butane lights immediately if the tank is not frozen and can be turned full on in one minute. Alcohol lights immediately. The pump-type gasoline stoves light in 30 seconds to one minute. Some of the self-pressured gasoline stoves in cold conditions may take longer, and several tries. Kerosene stoves usually take longer.

4. Light Weight of Stoves. Some of these stoves were designed to be carried on a boat instead of up a mountain. Most of the cases are made of steel or brass when aluminum and stainless steel would do the job at one-third the weight. For example, several highly experienced mountaineers swear by the performance of the Optimus 111B, and swear at the weight, 3.5 lbs. (Our test was 4 minutes to boiling, not 8 as reported in Off Belay.)

5. Light Weight of Fuel. Gasoline and butane are equal in heat content per pound of the fuel itself. However, gasoline can be carried in light weight containers. A 1-qt aluminum fuel bottle holds 24 oz weight of fuel and the container weighs 5 oz. Four Coleman or Gerry gas cartridges hold the same 24-oz weight of fuel, but the containers weigh 18 oz. If you are at all concerned about the total weight of a pack, gasoline is the better type of fuel, even more so if you are conscientious and carry the containers out. Alcohol comes in a poor third, having only about 56% as much heat per lb.

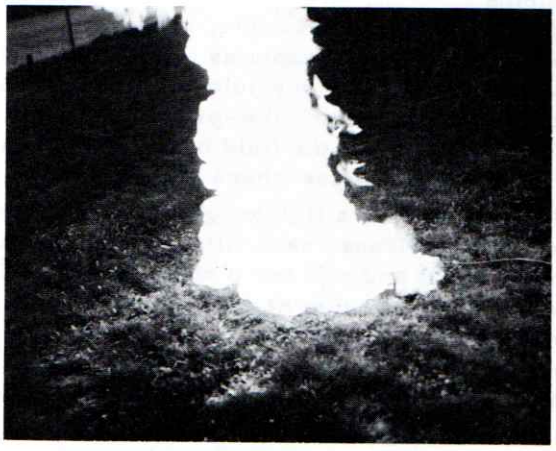
6. Fuel Capacity. Some stoves contain so little fuel that they have to be refilled whenever there is a significant cooking or melting job to be done. For example, Svea 123, Optimus 8R and 99, and Mini Enders have a fuel capacity of only about 4 oz weight, which is a real nuisance when refilling has to be done in difficult conditions.

The tanks weigh the same, 5 oz, but the Mini Enders holds 4 oz (wt) and the MSR, 24 oz.

7. Safety. Several problems regarding safety have appeared with various stoves. Failure to function can be called a safety function when the stove is needed for cooking or water melting. The stoves which do not have pumps are usually started by pouring some gasoline on the fuel tank. This gasoline makes quite a flare after the fuel in the priming cup reaches the boiling point. All of the stoves having small fuel capacity require repeated filling of the tank during extended use. Refilling includes spilling which is a potential hazard.

Summit magazine, September 1972, had an article entitled, "Coleman Cartridge Explodes." The user had placed the stove in a group of rocks which were being used to hold a large pot. Heat reflected from the under side of the pot down onto the cartridge and created a runaway situation. The hotter the cartridge got, the higher the gas pressure and the larger the flame. The larger the flame the hotter the gas cartridge until the "explosion." Butane (LP) gas cartridges should be maintained at a temperature which is comfortably hand-warm, not cold nor hot. This will give a pressure of about 50 lbs per sq inch. The container is tested for 240 psi, so the "explosion" hazard should not be present when the cartridge temperature is checked frequently.

A Coleman cartridge does not explode in a technical sense because it has a tiny melt-out plug which releases the gas at 174°F. But it does make a big flare. Prepo and Gerry cartridges actually explode with a bigger flare at 230°F.



Rarely, fires while changing Bleuet butane cartridges have been reported. These were probably due to failure to unscrew the perforating pin before assembly in the presence of other flame.

A lesser safety hazard is the instability of some stoves which are high compared to the diameter of the base.

Overheating in the fuel tank can occur with the self-pressured gasoline stoves, but the boiling point of gasoline is much higher than for butane, and we have heard of only one "explosion" of a gasoline stove. However, most of the foreign stoves have pop-off pressure release valves built into the filler plug. These pressure release valves have sometimes let go, sending a jet of inflammable vapor up 18 inches. Unfortunately, the opening of this relief valve points directly at the cook. The obvious solution to this hazard is to have someone else do the cooking.

8. Economy. White gasoline at 50¢ a gallon is the cheapest fuel. Canned appliance (Coleman) fuel is next, at about 90¢ a gallon. A gallon provides about 125,000 Btu. To get an equal amount of heat from butane, 16 Coleman, Gas, Bleuet or Gerry cartridges would be required at a cost of $14 (not $4 as given in Off Belay). Alcohol would cost $4-6 (1.8 gallons). Obviously gasoline and lantern fuels are much more economical.

We recommend Coleman fuel. It is a pure straight-run light sweet-odor naphtha which is a petroleum fraction in the middle of the white gasoline range. The lower and higher boiling point fractions have been refined out. It contains a stabilizer to increase shelf life (3 years unopened, 6 months after opening) and a rust inhibitor. We think it is worth the 40¢ extra to get away from the "gasoline" odor.

Did you know normal white gasoline has a shelf life of only 3-4 months? The molecules recombine to form gums and varnishes, accelerated by the presence of oxygen. These can cause clogging of burners. On aging, gasoline has a sour odor.

9. Efficiency. It is one thing to convert gasoline into heat, and another to transfer the heat into water efficiently. When the fuel burning rate is too small, the heat losses from the pan are too large a fraction of the heat produced. As a general rule, a fuel burning rate of not less than 4 oz weight per hour (5.3 fluid oz) is needed for 2-quart and 3-quart pans.

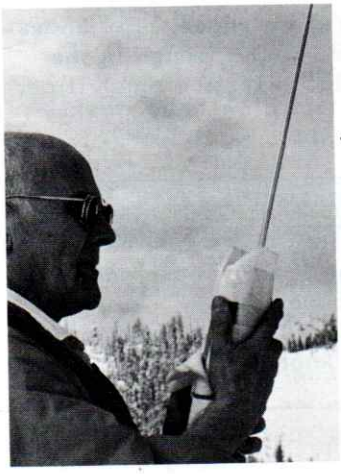
Another factor in efficient transfer is what happens to the hot combustion gases after they are formed. Most stoves allow these gases to escape after they have passed outwardly along the bottom. It would be much more efficient if these gases were directed up the side walls of the pan for more extraction of heat.

10. Fuel Esthetics. Leaked butane liquid becomes a vapor in one second and blows away, leaving no odor. Coleman Fuel and alcohol evaporate fairly quickly, say 10 seconds for a surface coating, and leave no odor. White gasoline takes a little longer to evaporate due to the content of higher fractions, and leaves an odor. Kerosene evaporates poorly, and gives an odor to everything in the pack.

CB Radio on Rainier

The Park service is concerned about the safety of climbers on Mt. Rainier and the safety of rescuers who go after the climbers when they are overdue. The Service is leaning strongly toward a requirement that parties carry radios. The RNP radios (FM) cost too much to lend ($1100), so MSR has been testing the use of Citizens Band radio on summit climbs.

CB radio is attractive because of lower cost, but how well do the various sets on the market perform? We couldn't afford an exhaustive study, but we did test three brands and five models.



Realistic 5-watt (R-5 and 3-watt (R-3) both performed acceptably from 9500 ft on Success Cleaver last summer. It was possible to hear stations in Olympia, but they had difficulty hearing us because of their local crosstalk and static. Conversation with Eatonville and Packwood was good and with Longmire even better.

The Realistic 3 was used on a winter climb of Ptarmigan Ridge. It worked OK for 3 days and then quit receiving. A receiving transistor had opened up. The repair shop said this could happen at 0°F, but the set never got that cold. ? ? ? Repair cost $12.

We had two R-3 sets. One was distinctly fuzzier than the other. When we took it back, the store manager pronounced it of the quality they offered at the price and declined to have it checked by his repair shop at his expense, even though it was still in warranty. (The set that quit on the mountain was the better one.) So we are not impressed with the Realistic.

Midland 1-watt and 2-watt. Two examples of the M-1 were so poor in performance we didn't take them up. The M-2 performed better, reaching (somewhat weakly) from Longmire to 12,000 ft. Its clarity was on the poor side both transmitting and receiving and we have stopped using it on climbs.

Johnson 3-watt (J-3). This model has been in mountain use for some years at Stevens Pass Ski Patrol, with good results and reliability. We have tested it in the mountains with such good results as to intelligibility of speech we have decided to adopt it for the MSR Climbing Club. It weighs 2 lbs vs. 2.5 lbs for the Realistic 3 and 5 pounds for the Realistic 5. It uses a shorter antenna which is a convenience when carried in the pocket of a pack on standby. Its only disadvantage is higher cost, $160 vs. $90 for R-3. J-3 has 2 channels instead of 3 in the R-3, but extra crystals can be carried for other channels if desired.

MSR is now a dealer for Johnson and has the 3-watt model in stock. Further, the MSR Climbing Club makes its radios available to its members on a cost-sharing basis. Membership is available to climbers interested in promoting climbing safety and who agree to abide by FCC rules on use of CB radio. See catalog section.

Boots

Toe Pinch

Having bought new boots recently, we studied the way the folds above the toes started to develop in the first minutes of use. A fascinating subject. One shoe started to develop a downward fold onto the big toe tendon. This is a no-no, so we tried to persuade the fold to go up instead of down. This was not possible until we took the laces out of certain eyelets. Eureka! The fold now goes up, out of the way.

Why do we use all the eyelets in a boot? Why ar all of them there? Because the boot designer's fathe and his father's father before him also designed them that way? This will bear further study.

A Simple Tied Harness for General Climbing

Accident reports indicate that a person hanging in a waist tie-in (Bowline-on-coil) has a remaining lifetime of 22 minutes: ten minutes in which he can do something; and twelve minutes in which to finish dying. If the climber is dazed after the fall, he may not be able to use the ten minutes effectively, and is finished.

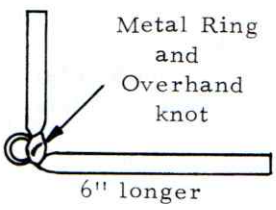
Any harness that distributes the load of the rope over the body is an improvement. Some harnesses are tedious and time-consuming to tie. Here we offer a simple one that has been in use for three years. Tied once, it does not have to be re-tied.

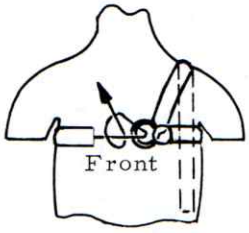
Medium-sized persons will need 9.5 feet of webbing for the chest portion and 13 feet for the seat. Large, 10.5 and 14 feet. MSR sells a kit for making a tied harness. See page 13.

Chest Portion

Tie a metal ring with an overhand knot near the center of the webbing, with one end 6" longer than the other. Hold the ring on the middle of the chest and throw the short end over the left shoulder. Wind the long end leftward around the chest (trapping the short end) and through the ring. Tie an overhand knot, making the webbing snug with inflated chest.

Bring the short end up and over the right shoulder and join the two ends with a 3-layer square knot.



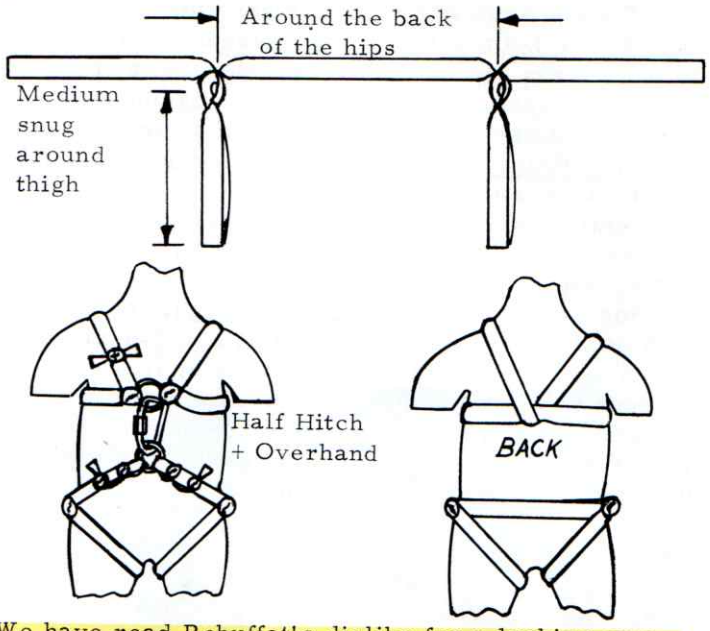


Note: Any synthetic including nylon will melt-abrade if a loaded rope runs across it as is possible in hip belay. Instead, use a Sticht Link or Munter Hitch in a carabiner for belay friction and rappel.

Seat Portion

By trial, tie two overhand loops as shown. Tie each end to the ring with two half-hitches and an overhand keeper.

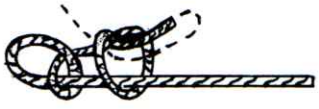
Connect the two portions with a good locking carabiner or MSR Lock Link. Use a small figure-eight loop on the climbing rope for latching in.



We have read Rebuffat's dislike for a locking carabiner for this use and do not agree with him if the carabiner is good quality. He is thinking of the obsolete Kamet and Marwa carabiners with the bevel gate. If you are worried about the rope load coming on the gate, rotate the carabiner half a turn through the rings; the rope will then be on the strong side.

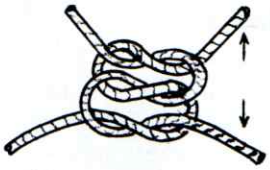
The speed and ease of latching-in (vs. the tediousness of tying in) are both valuable in bad weather, because latching-in can be done with mittens on. Further, you may want to disengage from the rope quickly in an emergency and for rest stops. Still further, the harness is in place all day, ready for instant use, and you won't neglect to use it when you should.

Useful Knots That Sometimes Aren't Taught



HALF-HITCH + OVERHAND

This knot can be tied even in the middle of a long rope, making the hitches with a bight (rope doubled back on itself) before threading through. Load can be lowered slowly using the half-hitch for friction after the overhand is released. Use slip knot instead of overhand for quick release (dotted line).



THREE-LAYER SQUARE KNOT

The third layer makes this knot secure. Add a fourth if you wish. Easy to untie, even after heavy loading by pulling sides apart alternately in direction of arrows.

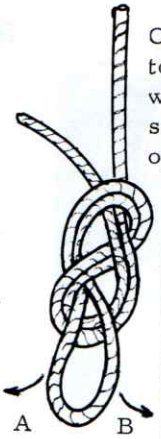


FIGURE-EIGHT LOOP OR BEND

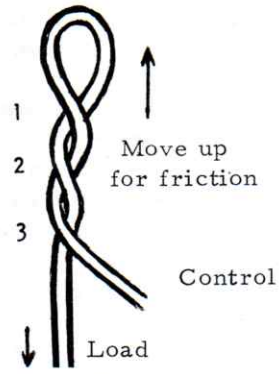
One of the most secure of knots. Can be used to tie two ropes together (a bend) as shown where A & B are separate ropes. Not necessary to thread one end back through in the opposite direction; this takes too much time.

DANGEROUS KNOTS

BOWLINE ON BIGHT. This knot can invert and become a noose if a bit loose and load comes on the two rope ends.

BOWLINE ON COIL. If the loop is turned the wrong way, the knot looks almost OK but is a noose.

The Saxon Cross for controlled rope restraint (belaying) comes from Germany. There it is shown being used with a non-twisting carabiner. We have borrowed it for use with an ice axe.
The available friction will vary with the number of crosses. Three is minimum, shown in the diagram.



Note: The Saxon Cross is not convenient belaying from a carabiner attached to the harness because the arms have to be extended so far to reduce the friction when taking-in. A Sticht link or Munter Hitch is better.

Tripod Brace

The Saxon Cross eliminates the need for the boot for friction. Instead, both feet are stomped into spaced sockets below the ice axe and the head of the axe is braced with one hand, forming a tripod. The rope goes between the legs if this will be the direction of rope pull. This roughly doubles the holding power of the belay, because the rope can be allowed to cut into the snow and increase friction and because the top of the axe is being braced effectively.

BOOT AXE BELAY SYSTEM

The boot-axe belay system is or should be obsolete. First, the rope runs over the boot and thus is 2" above the snow. Actual field measurements show this decreases the holding power by 20% because of the 2" of increased leverage against the snow. Second, the body position is precariously perched on one foot, aided by the other foot as an outrigger, but not as a tripod. Precariosity is the last thing you want in a belay stance.

MUNTER FRICTION HITCH FOR BELAY AND RAPPEL

To tie the Munter Friction Hitch, form the rope like a capital R. Engage the two center bars with the carabiner. The knot will invert according to the direction of travel of the rope. The restraint applied to the control side by the gloved hand is multiplied by about 20 on the load side.

Dan Meier did wear tests and found the sheath will wear through absorbing the energy of 32 hard falls at the same spot. The wear due to ten rappels is not enough to be noticed.

Ralph Zundel (Idaho Mountain Rescue) and Paul Shafer (Dartmouth Mountaineering Club) have written that this hitch should be used with a locking carabiner (or MSR Lock Link) to avoid having a direction reversal throw the hitch loop onto the gate and undo the hitch. Ralph, Dan Meier and Pete Saunders have written that it can lock on a D carabiner if the reversal is made with too much slack. This is true, although we found that the lock pulls through on increased load. . . . The Munter Hitch works best with the MSR Lock Link, using the broader end. It also works with oval carabiners.

SUMMIT MAGAZINE ARTICLE "MSR Axes Break"

Summit reprinted without investigation parts of an article from Thrutch (Australia). We now have direct reports from New Zealand; it is plain that the situation was much overstated in the Summit version. Here are the facts as reported to us:

1. No head fell out of the shaft. One head did wiggle after being pounded on with a hammer.

2. One adze broke at the weld to the pick. This axe was made in England in early 1971, and may have had insufficient weld metal. We have not seen the axe.

3. The article said, "breaking under very moderate conditions." But it is now clear that New Zealand practice includes pounding with steel hammers on the shaft behind the adze and on the top of the head, and that this was done to the two axes whose shafts split. This mistreated aluminum was entitled to split.

4. The article said, "Both the adzes and picks snapped off." This sounds like popcorn, but the reports cover only one adze (mentioned above) and one pick. We doubt the reference to the pick (in which the grain of the metal runs the strong way) but, if true, we wonder about prior poorly aimed hammering.

Colin Monteath writes: On reflection, my criticisms were too severe. MSR has done the climbing world an important service by making us aware of the weakness of many wooden shafts. The design of your picks re self-arrest capabilities is terrific and the positive clearance aspect is one many manufacturers still seem to overlook.

This closes our investigation because none of the axes reported broken has been found for return to us. It would have been more astute of Summit to have got the facts before publishing, or at least to ask us what we knew about it.

Summit printed a call for reports on ice axe failures. We wonder how they will handle them. For example, the Mt. Russell Expedition reported that an MSR axe bent "badly" when used as an anchor while pulling one person out of a crevasse. They indicated a load of 700+ pounds, which is possible if the rope had cut into the snow. But whether the axe performed "badly" or "magnificently" depends on the distance from the rope down to load-bearing snow. Jene Crenshaw, co-editor, told me she doesn't understand what bending moment means. Would some technical person please volunteer to help her?

More re Helmets

MSR HELMETS IN FALLS

In Issue 6, we devoted four pages to a discussion of helmets. This is a continuing report. The MSR climbing helmet has had excellent acceptance, 3,000 sold in one year. Two accidents have been reported to us where the climber was using our helmet.

A Washington Alpine Club member tumbled about 1,000 ft down Mt. Stuart on snow with rough spots. He suffered a broken leg and many severe bruises but his MSR helmet stayed on all the way and he had no head injury.

Larry Gorbet fell about 70 ft on Tahquitz Rock, striking his MSR helmet once on the way. From the scar on the helmet, he would have had a severe head laceration and possibly a skull fracture if he had not been wearing a sturdy helmet. We sent him a new one, and have his on display.

BUTTONS INSIDE HELMETS

In Issue 6, we pointed out the presence of multiple "buttons" of metal and plastic inside several helmets, and theorized the force of a blow over one of these buttons would be transmitted directly to the head.

This is more than theory now. A climber from San Pedro caught his foot while glissading and was spun sideways, hitting his head in a JB helmet a glancing blow against a tree. He had a severe headache with special soreness of the scalp corresponding to the buttons on the side which hit. If you have a helmet with inside projections higher than the foam, such as the JB, they owe you a suspension which doesn't have such projections. Ask for it.

THE "ULTIMATE" HELMET

Speaking of poorly designed helmets, the so-called "Ultimate" helmet joins the ranks. First, it has several rivets and "buttons" inside which will transmit force directly to the skull. Second, the foam is only 1/4" thick and is so soft it has little cushioning ability (very small force times distance). Fortunately or unfortunately, the worst buttons are between the test points which are checked for shock loading.

REI did not test this helmet for cushioning of top impact before showing in the catalog. It is sold as adjustable up to 7-3/4, but that is not true; the shell is too small.

REI has a letter from a testing lab in England saying the helmet meets the British Standard 4423 for front, back and side impact, but the rigid inside projections are located 30° off axis and no tests were made there. The British Standard is faulty and should not be used as the basis for acceptance. That "standard" is silent about the cushioning of top impact and the presence of rigid projections inside the shell.

GALIBIER HELMET

The Galibier helmet also is a poor helmet. The shell is flexible polyethylene. The foam around the rim and in the center of the crown is so soft it is meaningless. In the Z-89 drop test, the transmitted force went off scale, over 1500 lbs. The chin strap allows the helmet to dislodge backwards.

MAMMUT DYNAMIC 11MM ROPE

Heinz Weber of Arova - Lenzburg (maker of Mammut Rope) took strong exception to part of our comment in No. 6 Newsletter; he objected to the one-hard-fall-retirement-for-Mammut idea and has sent us oscillograms of a Mammut rope taking four UIAA falls before rupture. The UIAA fall test is severe, so we accept his position for the moment.

We do have a basis for our comment. Heinz declined to discuss the characteristics of the nylon yarn used in Mammut Dynamic rope, but the Handbook of Textile Manufacture, Vol. II, ascribes this curve to a yarn which is not fully drawn. This means that the molecules have not been fully oriented for highest tenacity. If so, this could account for the lower breaking strength of Mammut vs. Edelrid. Heinz counters that energy absorption per meter of rope is more important than breaking strength. We reply that peak force in succeeding falls and ability to recover dynamic properties are also important.

The complete analysis of a climbing rope would cost about $3000. Obviously we are not going to put that kind of money into a study of Mammut ropes, but we hope to have a more comprehensive report in the next issue. In the meantime, don't get us wrong; Mammut is a good rope. We said that already in No. 6 Newsletter.

Eye First Aid

On Success Cleaver last year, we encountered much dust, some of which accumulated in our eyelashes. We should have washed it away but hadn't. Inadvertently I rubbed my eye and pushed some dirt inside the lid. Knowing volcanic dust is sharp and hence dangerous, we devised a method of washing which is not in the First Aid books.

Facing downward, make a cup of the palm and pour water into it. Holding the palm next to the eye socket, flatten the palm to deliver the water gently to the closed eye. After several washes to soften the encrusted dirt, brush the eyelashes with the finger very gently to loosen the dirt and repeat the washing several more times. Then start to allow the lids to open a tiny bit at the moment of flushing. Keep the face always downward. After a dozen or so flushes, the particle should come out. It did for me.
Note that any attempt to lift the eyelid before thorough cleaning would have led to disaster.

The above methods should be tried before using the textbook methods of direct search by someone else. Always reserve a pint of plain water in the party in dusty circumstances for eye cleansing.

RECREATIONAL EQUIPMENT, INC.

Last year we asked Jim to stop selling wooden-shafted axes. He replied (21 June 72) that wooden-shafted axes offer "a less expensive and yet uniquely satisfactory ice axe for people who use them as a safety device for crossing steep snow and ice slopes and for simply making self-arrests where the strength of the shaft is of minor importance."

A short time later, Willi Unsoeld came in with the wooden-shafted axe he had used on Everest. It was broken and he wanted a metal shaft put on it. I pointed out to Jim that Willi is not exactly a beginner and how awkward the break would have been had it occurred on Everest. He replied that the axe should have been returned to REI and not to MSR.

We further pointed out that strength of the shaft is highly important as a safety device for crossing steep snow and ice slopes. That is what it is for.

We then asked him to describe the superior properties of MSR axes in the '73 catalog in place of the weak description in '72. He agreed we were entitled to "better" billing, but the '73 catalog copy was quite inadequate to help our purpose to drive wooden-shafted axes off the market. So we blew our Calm and told them to take our axes out of their catalog.

REI will make a partial test of used wooden axes on Mondays. If the shaft breaks, tough luck, even though you got it at REI. But they comfort you with these fine-print words on page 44, under Other Quality News: "But it's better to buy a new axe than risk your life with a potentially defective one." This gem of wisdom ought to be in bold type at the top of the ice axe page.

But the test is only 400 lbs and does not include the portion where the tangs join the wood. Loads in holding a fall often exceed 400 lbs, and they know the proposed UIAA test is 800 lbs. Further, axes often break at the tangs. Are you supposed to buy a new one of the same kind as the old one that broke?

The description of REI crampons says: All models are hinged type to comform to the flexing of the boot while walking and climbing. But look again where that hinge is on some sizes, clear back under the instep. Most boots have steel shanks that flex at the ball of the foot where feet do. There is a mystery here that has escaped the Advisory Committee.

John Farkas and Lee Barry, New York, have both written us descriptions of the breaking of their REI crampons where the connecting bar should have been hinged but wasn't.

Did you note in the 1973 catalog that the ends of the picks are all shown with negative clearance which will tend to skid on hard snow and ice? Our printed message in May 1971 didn't sink in.

REI has added the "Ultimate" Helmet to its catalog without drop-testing it for cushioning against top impact (falling rock), and without inspecting it for inside projections that could dent the skull in a tumbling fall. How come this omission got by the Safety Engineer and the Quality Control Advisory Committee?

Fly Your Tent Down the Freeway

Lacking a wind tunnel we built a platform on our truck and mounted the MSR Tent on it. After obtaining a Wide Load permit from the State Highway Department, we tested the tent at 60 miles per hour. It held up fine. The Seattle Times was so intrigued that they sent a photographer to ride the chase truck and take pictures, printed 20 April.

This test facility is available to our members at operating cost.

CHOUINARD-FROST ICE AXES

We have several reports of the breaking of the ends of the picks of C-F ice axes from a lot sold after 1 January 1973. We tested one and found the hardness to be Rc 54, which is in the notch-sensitive range of steel. If you have an axe from this lot, we suggest you send it back for correction. We are working for C-F to develop a method of correction, which we think will be to grind out the sharp corners at the bottom of the teeth and further heat-treat to Rc 50.

C-F tells us that axes sold before Jan 73 were Rc 50 (lower hardness) and have not experienced this breakage problem.

Don't attribute any magical properties to laminated bamboo. It doesn't have any. The laminating makes the strength consistent, but the overall strength is in the range of ash.

(REI)

The English Poly Bottle (JA-11) Controversy rages on quietly. The eight that others and I tested last year gave a bad taste to water. The manufacturer says 'taint so, and threatened us with "gross libel". More of these bottles on the shelf this year also have a chemical odor. You be the judge; if you get one that gives a bad taste, send it back for refund. A plastics raw materials manufacturing engineer told us that polyethylene can contain unreacted ethylene, catalyst, amides, stearates, and stabilizers. Which do you think is causing the trouble?

New MSR Stove

Our hottest new item this year is the MSR stove. In our testing of stoves on the market last year, we found problems. As you know, this stimulates us to action and we have engineered a light-weight stove to meet those problems. It burns gasoline and Coleman stove fuel, and really puts out the heat.

The MSR Stove is in two parts: the pump, which screws into and is carried inside the aluminum fuel bottle; and the burner, which plugs into the pump. The fuel bottle itself serves as the fuel tank of the stove, and the pump is moved from bottle to bottle as each one becomes empty. The fuel bottle is the standard one made by Sigg, and is interchangeable with the bottles which have been sold for years.

1. Sufficient Heat Output. One of the factors predisposing to acute mountain sickness, we believe, is dehydration. When all water must be obtained by melting snow, a goodly volume of heat is required to melt the required water in a reasonable time. So we designed a 2" burner instead of the usual 1.25" burner. The fuel burning rate at maximum output is 9 oz weight (12 fluid oz) per hour. This is double the output of many stoves. The burning rate can be turned down by the valve to 2 oz per hour.

2. Reliability. Experienced mountaineers have emphasized to us they insist on stoves with pumps to avoid variability of performance. From our experience and testing, we heartily agree, and have provided the MSR stove with a pump. The stove performs excellently no matter what the temperature of the fuel tank, even if ice cold.

Our biggest innovation for reliability is the discovery that a fine screen inside the tip eliminates clogging. The technical explanation involves thermal cracking of the gums and higher-fraction components of gasoline. This has done so much for reliability that we believe there is patentable novelty, and have applied.

3. Speed of Lighting. The MSR stove lights for cooking in 30 seconds and reaches full heat output in 60 seconds. This has been achieved by making the mass of the vaporizer small and providing it with an internal vaporizing helix.

4. Light Weight of Stove. The MSR stove weighs 12 oz compared with 1.5 lbs to 3.5 lbs for most other gasoline stoves. We don't count the weight of the fuel bottle because you carry one anyway.

5. Fuel. Burns stove and lantern fuel and white gasoline. These weigh appreciably less overall for a given heat content than butane (LP gas, Bleuet, Gaz) and alcohol. Will also burn non-leaded and leaded gasoline for cars provided the screen is cleaned every two quarts. Will also burn alcohol if the air inlets of the burner are mostly closed with foil.

6. Fuel Capacity. Two sizes are available:

(Volume)	Weight of Gasoline	Burning Time at Maximum Heat Output	Burning Time, Average Use
1 qts	24 oz	2.7 hrs	4 hrs
0.6 qts	15 oz	1.7 hrs	2.5 hrs

7. Safety. The prime point of safety in the MSR stove is that the fuel tank (bottle) always stays cool. There is a gap of 4" between the burner housing and the tank for ventilation, and in addition, the heat-conserver windscreen isolates the tank from the burner area.

The valve is on the pump at the fuel bottle, outside the burner area. One does not reach next to the flame or hot pan to control the heat. Stability of the MSR stove is excellent, due to the low pan height and the outrigger aspect of the fuel bottle.

When starting the MSR stove, a small amount of cold gasoline is admitted to the burner thru the valve, where it runs down into the asbestos pad. The gas is then ignited by the built-in sparker. Gasoline vaporizes uniformly from the asbestos, thus flare-up is avoided. The pre-heating flame is well behaved.

The pump is moved from empty bottle to full bottle, thus avoiding the spilled fuel of tank-refilling.

8. Economy. The first cost of an MSR stove is $12 higher than for the butane stoves, such as Bleuet, Primus and Gerry, but you save $13 a year if you burn one gallon a year. Comparing with Primus-Optimus pump stoves, at $14-24, the price is in the middle; you gain by lighter weight and higher heat output. Compared with Svea 123 and Primus non-pump at $12, you get double the performance, reliability and about half the weight.

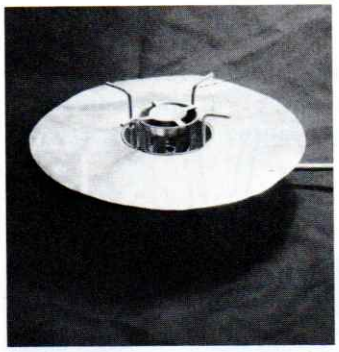
MSR Stove Model 9 with aluminum cup cover and built-in spark lighter	12 oz	#220	$19.45
Aluminum Fuel Bottles 1 qt, Wt 5 oz with rough identification band		#240-B	$ 1.80
Same, 0.6 qt	4 oz	#241-B	$ 1.60
Pan Lid, 7", for use as platform when using stove on snow,	1.4 oz	#246-7	$ .55

You don't get a tool kit with the MSR stove because you don't need it. The pump cup can be inspected and oiled by unscrewing the bushing by hand. The jet doesn't need cleaning if you use Coleman Fuel or white gasoline; it can be removed for cleaning of the screen (if you use gasoline for cars) using a coin as a tool.

EFFICIENCY

The MSR stove is more than a burner, it is a heat transfer system. A 9" flat ring of thin aluminum 6.5" high deflects the hot gases upward along the sides of the pan for more heat transfer and protection from the wind. Further, MSR pans are chemically darkened for absorption of heat. The result is fast, efficient heating.

Indoors, the MSR stove will bring a quart of water from 55° to full boil in 3 minutes. In outdoor light wind at 35°, 4 minutes 15 seconds. Pan 7" diameter x 5" high with lid, using reflector.



HEAT REFLECTOR & WIND SCREEN

Flat ring and collar, 9" diam x 6.5" high. Ductile aluminum .006" thick which can be folded and unfolded many many times. (For reference, heavy duty kitchen foil is .001") 2.5 oz/set #222 $2.60

Cooking Utensils

The way to make a pack lighter without leaving needed items behind is to make each item lighter. We ordered a special run of lightweight saucepans without handles. They weigh distinctly less than most such pans, and nest very well to occupy little net volume in the pack. Metal thickness .023".

We do more than just "merchant" these pans; we chemically gray the outside for better heat absorption and hence saving of fuel. Shiny aluminum reflects heat; why ignore the laws of physics?

A lid is important on a pan to conserve heat, cook the food more uniformly, and to keep combustion gases from giving an undesired taste to water. We tape the D-ring handle for insulation.

2-quart pan with lid	4.6 oz	#242	$1.85
3-quart pan with lid	5.7 oz	#243	1.95
Pot Lifter, aluminum	oz	#245	.50
Lid 7" diam	1.4 oz	#246-7	.60
Lid 8" diam	1.6 oz	#246-8	.65

FRY PAN OR PLATE

8" Fry Pan, Teflon II coated, not blackened on outside, medium weight aluminum, .030". Nests with 3-quart pot and itself. Uses pot lifter above as handle. With lid. 4.6 oz #244 2.45

ALUMINUM CUP, 13-oz capacity. Smooth sides which are easier to clean. 15 oz #247 $ .60

BOTTLES, PVC. These are polyvinyl chloride, not polyethylene. Big advantage over PE is freedom from taste carryover. Can be sterilized at 180°F (not boiling as said in No. 6)

Cap. 8 oz, Wt. 1 oz	#174	$ .95
Cap. 16 oz, Wt. 2 oz	#175	1.40
Cap. 32 oz, Wt. 3 oz	#176	1.95

Note: If your PVC bottle is warped from being filled with boiling water and then capped, pour some more boiling water in it (to 1" from the top) in an upright position with the cap off. After the sidewall has straightened, add cold water before handling.

If the gasket has shrunk, cut another from inner-tube patching rubber or write us for a replacement, stating the size. No charge.

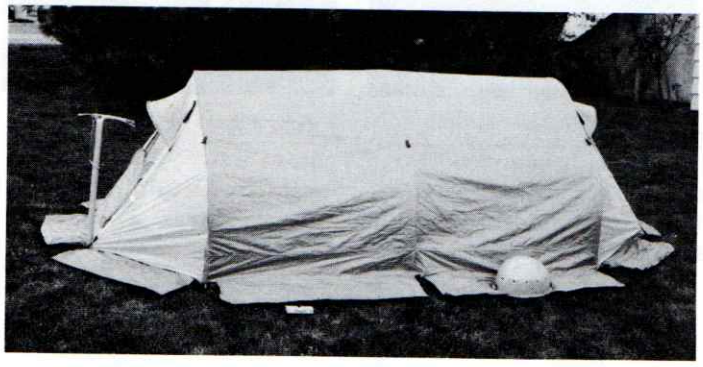
ALUMINUM FUEL OR WATER BOTTLES

1 quart, plain	5 oz	#240	$1.65
same but with rough identification band for fuel use.		#240-B	1.80
0.6 quart, plain	4 oz	#241	1.45
same but with rough identification band for fuel use.		#241-B	1.60
Rough identification bands for your fuel bottles. Self-adhesive.		#248	15

Note: MSR Pans have rounded bottom corners for easier cleaning. Some pans on the market, such as in the Sigg Cooker, have two sharp lower corners which are more difficult to clean.

MSR Mountain Tent

Two years ago we imported the Salewa-Hiebeler Mountain Tent, Quonset hut shape. It was a good little tent, which started us thinking how to improve it.



More Room - Three-Man Size

Due to the barn-like shape, the big gain for the MSR Tent is volume--68" x 120" x 39" = 103 cu ft. Tents are often rated by floor area, but this doesn't tell the whole story. For example, the "Arctic Expedition" tent at REI has a floor 90" x 90" but because of its pyramidal shape and low peak (48") has a volume of only 75 cu ft, part of which is unusable because of the center pole, and another part around the rim is of limited use because the roof pinches down to the ground there.

Three hoops are used (MSR) to minimize loss of volume by sagging. They are 2024 aluminum tubing, jointed (18") and are held together by inside elastic cord.

Condensation

The single roof Salewa tent had plenty of condensation. Many tents use a porous inner tent to let the vapor escape and a coated fly to keep the rain from coming in. The MSR Tent has these two layers in one construction. The inner roof lets water vapor go outward where it condenses on the outer roof and runs down to the ground outside. There are spacers to keep the two layers apart.

Above 15°F, there is practically no condensation on the roof. In colder weather (15°F and below) a thin layer of ice will form on the central portion of the roof. We know of no way to prevent this. The endwalls of the MSR tent are single layer, and condensation will form there. We could have made them double wall also, but the amount is so small we considered the extra cost would not be justified. We will provide double end-walls on special order.

Doors

Both ends have nylon-coil zippered doors for easier 3-man use, two headed at one end, one at the other. If you have cold feet, choose the #2 position. Both ends have a removable zippered mosquito net and a hood over the top of the doors to keep rain out when they are open for ventilation.

Ease of Erection

The three hoops are assembled and threaded into tunnels. Four aluminum stakes then hold the tent upright. Ten loops at mid-level can be tied to guys (not included) in case of high wind.

Wind Stability

The outer layer of the roof extends down to the ground with 12" additional for snow or sod flaps. These keep wind from getting under the fly and flapping it excessively or carrying it away. The end walls are cones for streamlining against wind. Tested at 60 miles per hour on the freeway. See page 7. Bill Lokey, Antarctica and expedition veteran, rode in it at 50 mph and said it is the quietest tent he has ever been in at similar air speed. Tested endways, sideways and 45°, all OK. We know wind can get stronger, but this test is fairly severe.

Cookholes

Two zippered holes in the floor, 18" semi-circles, one at each end.

Materials

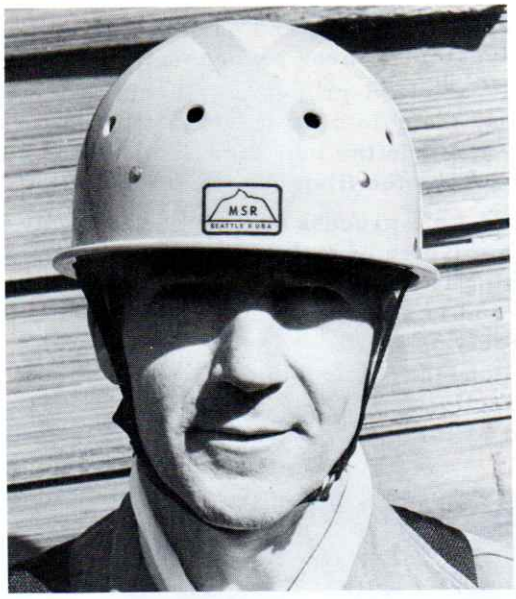
Coated ripstop nylon floor which extends 4" up the sides. Uncoated, 75 oz ripstop nylon inner roof, coated ripstop nylon outer roof. The outside roof is blue and the inside is sunshine yellow for reflection of inside light. The end walls are yellow and orange for visual relief. Note: Tents which are all-blue inside are depressing in bad weather. Better to have a warm color, such as yellow or orange, but not a strong red.

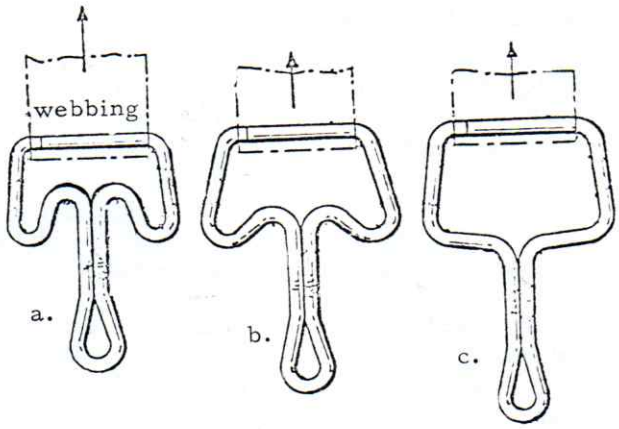
Weight

Only 5 lbs 12 oz including four stakes. This includes the built-in rain fly and poles. The light weight costs more, but the lighter your pack, the more you'll enjoy the backpacking. We are planning only 100 tents for this season. If you want one of these tents, please don't delay ordering.

5 lbs 12 oz #181 $155.00

MSR Climbing Helmets





HELMETS, MSR CLIMBING

MSR Climbing Helmets offer a combination of features not found in any other helmet.

1. Retention of the Helmet on the Head. The MSR helmet uses the chin-plus-nape-strap system. Forward anchor points are as far forward as possible without interfering with vision. The nape straps are anchored at the center of the back to prevent forward dislodging of the helmet. The chin strap does not come out of the buckle, and has a strength of over 300 lbs.

2. Ventilation. The MSR helmet has 12 ventilation holes, a real improvement because it permits evaporative cooling of the head. The holes can be covered with adhesive tape in bad weather.

3. Weight. The MSR helmet weighs one pound two ounces medium size and one pound five ounces large. It is not so heavy that you are tempted to leave it at home.

4. Inside Space. The dome form of the MSR helmet is a tracer copy of the old Bell Malibu. However, we flattened the rim line to uncover the ears, added a small rim for side rigidity, and raised the dome 1" higher to provide clearance between the head and the shell for rock impact absorption. Note that a helmet has to have some space between the skull and the shell to allow the cushion to work.

5. Hearing. The MSR helmet leaves the ears mostly uncovered. This avoids loss of hearing, saves weight and improves cooling. In a tumbling fall, the shoulders and rim protect the ears.

6. Top Impact Cushion. Some industrial helmets meet the Z-89 requirement by using a molded polyethylene suspension together with flexure of the shell. But, polyethylene changes properties with temperature too much for climbing helmets, so we abandoned the search for energy absorption in the plastics materials and turned to metal. The best system we devised is a wireform link, shown in successive stages of elongation. The links absorb energy and stay bent, avoiding rebound. The Z-89 test is an 8-lb ball dropping 60". The MSR Helmet meets the requirement by a maximum transmitted force of 850 lbs

7. Shell Rigidity. The MSR shell is made of GE Lexan Polycarbonate resin, which is tough and strong. It passes the Z-89 denting test easily.

8. Penetration Resistance. Again, the MSR helmet passes the Z-89 test easily. Z-89 uses a one-lb pointed plumb bob falling 10 ft. The point only makes a mark.

9. Headband Cushion. The MSR helmet copies the expanded polystyrene liners which pass the Z-90 vehicular tests. This material crushes on impact, thus absorbing energy, and is of the thickness (5/8") which absorbs two blows in the same place.

10. Side-to-Side Rigidity. Improtant in a tumbling fall. The force required to compress the MSR helmet by 1/2" side-to-side is 36 lbs, which is higher than any helmet tested. This rigidity is accomplished by a small rim. The rim has another use: It holds the head farther away from the rock in the event of a tumbling fall.

11. Fitting for Size. Adjustable headbands have knobs and buttons which would be pressure points at the time of a crash and therefore we considered them not acceptable. Instead, strips of soft adhesive foam are supplied with the MSR helmet; you apply as much as wanted under the cloth sweatband for a comfortable fit.

MSR Helmet. Orange color. Send circumference of head or hat size.

1 lb 2 oz (S, M), 1 lb 5 oz (L, XL) #162 $17.95

Decorative cloth tape, 3/4" x 125". Red, Yellow, Green, Turquoise, Blue, Silver, Black #171 $ .40

CAUTION: Regarding the Polycarbonate Shell

Polycarbonate resin (made by General Electric, named Lexan) is an excellent material for helmets, being tough and strong. Industrial and vehicular helmets by the million are made of this material. But, don't paint the helmets because paints contain toluene, acetone, and chlorinated solvents which polycarbonate doesn't like. For decoration, use only cloth tape provided by us. Put a layer of this tape under decals and Dymo tape.

Sun lotions are harmless, and a bit of insect repellent carried to the helmet by the hands is no problem. But, don't pour repellent directly on the helmet shell. It will mar the finish.

Polyester Fiberfill Sleeping Bags

Polyester fiberfill in garments and sleeping bags has one big advantage over down: It doesn't collapse when wet. Wetness can occur from rain or snow, repeated exercise with sweating, sleeping in snow caves, and condensation drip from tents. For the same loft, polyester weighs a bit more than down, is a little more work to stuff, and takes a stuff sack an inch or so longer, but we think it beats down for use in Northwest weather.

Not all polyester insulation is the same, however. DuPont "Improved Dacron 88" is composed of unbonded fibers about 1.7" long and hence the batting can shift, developing clumps and thin spots. Dacron 88 batting can be pulled apart readily in any direction. Open a seam and see for yourself.

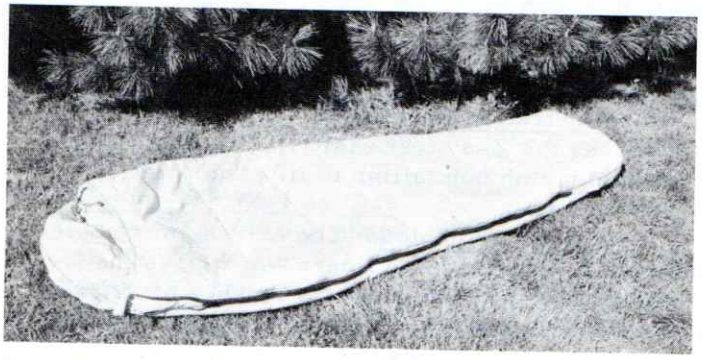
MSR sleeping bags and garments are made of 100% polyester by three processes:

1. Polarguard-process filaments are essentially continuous, many feet long. The batting is tough and strong by itself in the long direction, and is stitched (quilted) across the filaments to nylon cloth.

2. Hi-Loft-process filaments are highly kinked and are a mixture of 2" filaments and 6" filaments. This batting is also tough and strong in the long direction, and is surface resin-bonded for stability transversely.

3. Bonded interlocking fibers, tough and strong in all directions.

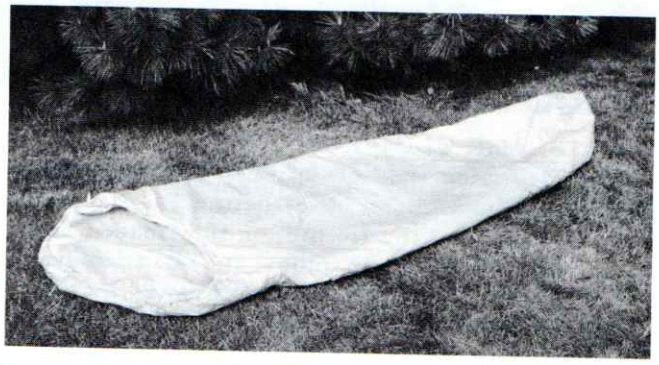
Send $1 for a sample kit of all three plus Dacron.



MSR POLYESTER SLEEPING BAG, 4" Loft

Each wall is made with two layers of Fortrel Polarguard polyester insulation, each quilted to its nylon only, hence no sewn-through seams. 4" overall loft. 1.9-oz Expedition Rip-Stop nylon. Delrin zipper with insulated cover flap. Drawstring with cord lock for snugging the hood over head and shoulders. Stuffs to 10" diam. x 20" long, bag included. Blue.

Medium	(to 5'10" tall)	4.7 lbs	#223-M $38.75
Long	(to 6'2" tall)	5 lbs	#223-L $39.75



MSR INSULATED BIVVY BAG, 2" Loft

For use over down or polyester parka, pants and booties, where weight must be held to minimum. Insulation is 6.8-oz High-Loft polyester. Tested OK on Success Cleaver at 16°F inside the tent on Ethafoam pad on snow. Drawstring with cord lock for snugging the hood over head and shoulders. No zipper, to conserve heat and reduce weight. Blue.

Lightest weight, 0.75 oz ripstop nylon. With sturdy stuff bag. 6" diameter x 13" long when stuffed, which is really quite compact. Available June.

Medium	(to 5'10" tall)	1.5 lbs	#226-M $38.75
Long	(to 6'2" tall)	2.3 lbs	#226-L $39.75

MSR Mountain Mitts

Last year we started importing mitts having nylon pile with nylon shell from Norway. They are a big advance over all the other mitts I have ever had for mountaineering: light, flexible, self-drying while being worn, and warm. For test, we dunked them and our hands in an icy stream for two minutes. By a whipping motion, most of the water spun out. More could be spun out by removing the mitts and whipping them across a boot. In either case, they were warm in two minutes and practically dry in around 20 minutes. A big advance in hand covering.

We modify the Norway mitts by adding a sprayed rubber coating to the palms to improve grip on tool handles and ropes, and we add a closing strap to keep snow out. Sizes 5 thru 9, or send outline.

Norway Mitts, medium thickness for use to 15°F without sprayed palms and strap, 5 oz #155 $7.50
With sprayed palms and strap, 6 oz #155-SS $8.95
MSR Mitts, heavier thickness for use to lower than 15°F. With handwarmer pocket. Available June
With friction-coated palms and strap #156 $9.50

WEBBING

2" black polypro, light and flexible, 2000-lb test on drums. Excellent for harnesses. 0.3 oz/ft #42 $ .11/ft

5" nylon, .024" thick, solid, tan. Strong yet flexible. For seat slings you devise. Trial quantity in stock at very low price to see what uses you can made of it. 4000 lb. 0.6 oz/ft #125 $ .12/ft
Minimum sale 8.5 ft for $1.00.

MSR Mountain Parka

Our design further features a polyester rebreathe flap for prewarming air and avoiding heat loss from and frostbite of the cheeks, nose and chin. A most useful addition in cold weather.

When the weather is in-between, you often want to let heat and moisture out, especially from under the arms. For this purpose, the MSR Parka has zippers under the arms and down the sides. No need to stop and remove your pack to change the ventilation, as is required in the old layer system. Blue outside, orange inside.

The big advantage of polyester batting insulation in the MSR Parka over down filling is that down collapses when wet and polyester does not. If polyester gets soaked, most of the water drip-dries out, and thus polyester is far better than wool or cotton or down. In this development, we follow the U.S. Army Natick Laboratory. They have stopped using wool for overcoats, and use polyester instead.

Bonded and Hi-Loft polyester batting are used in these parkas according to the desired thickness.

Medium	1.0" Insulation	20°F	#210	$48.50
Heavy	1.5	0°F	#211	53.50
Ex. Heavy	2.0	Minus ?	Available Sept.	

Insulation means the thickness between your body and the weather. Specify S, M, L, XL

Note: Ratings in degrees temperature are not precise, due to variations in exercise, wind, food intake, tiredness, other clothing, etc. In strong wind and rain, we expect you will use a shell outer garment.

Climbing Harness

One of our first areas of investigation in 1968 was to devise a light and comfortable body harness for general rock and glacier climbing to replace tying-in with a waist coil. A waist coil is an invitation to paralysis of the diaphragm and death by suffocation. The MSR Sewn Harness is our answer to the problem. Made of light and flexible but strong polypro webbing. Design tested by ten drops of a 220-lb torso dummy at shock forces of 1200-2800 lbs. Picks up load at five body points, but not at diaphragm level.

Quick and easy to put on to avoid party delay that occurs with a complicated webbing wrap. The two halves can be joined with a locking carabiner or MSR Lock Link, or can be tied directly to the rope. Chest and seat halves. Send chest and seat measurements.

	#23	$ 9.50
With MSR Lock Link	#23-L	12.00

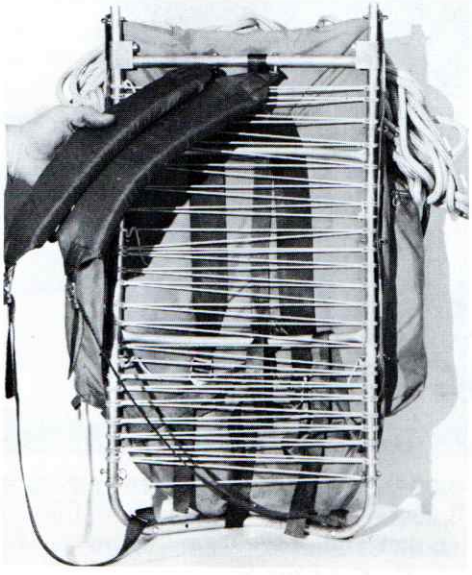
Note: High-angle rock climbers will prefer a tighter harness than the above, which is intended for average climbing.

HARNESS KIT

An adequate five-body-point harness can be tied by you. Kit has 25 ft of 2" polypro webbing and two rings with instructions. A closing carabiner is needed. See page 4.

	1 lb	#24	$3.00
With MSR Lock Link		#24-L	$5.50

MSR Frame Pack

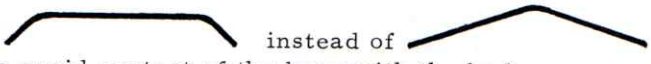


MSR FRAME PACK

When we needed a new pack, we found problems in the packs on the market. For example, some packs have back pads that bear only in the center along their length. The 3 or 4" width looks good on the shelf, but press on the pad with your fingers and you will see that only a 1.5" width is effective. This concentrates the load on one narrow band across the hips. By contrast, Ome Daiber's cord-strung back spreads the load over a broad area, and can be adjusted to individual back contour. So we borrowed Ome's 20-year-old invention. This overall contact helps protect the back from unwanted flexing when heavily loaded.

JanSport made both frames and bags for us in 1971, and hence we used their adjustable-height shoulder strap bar. It works well.

We redesigned the middle crossbars to be shaped



instead of to avoid contact of the bars with the body.

We lengthened the shoulder pads so the webbing would not bite into the flesh under the arm. The padding itself is latex foam which helps avoid high-pressure points on the clavicle. We also placed heavy webbing under the buckle to keep the buckle from biting.

Some backpackers like the load higher and some lower. The bag can be positioned at 3 heights, 4.75" apart.

The frame can be removed and the shoulder straps transferred to the bag for use as a summit pack.

The excess volume is taken out with the load-compressor straps. Further, the top bar is removable.

With ice axe loop. Crampons are carried under the middle load-compressor straps.

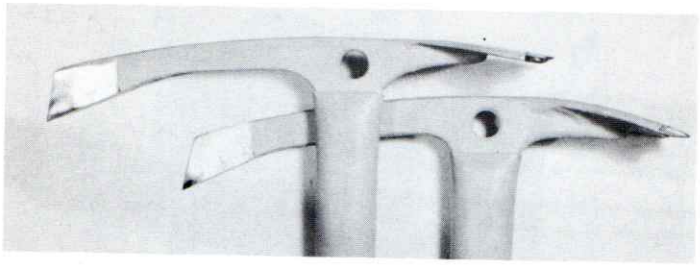
As to the bag, we borrowed from soft-side luggage to make a back panel that opens fully to allow finding things without taking anything else out, as is necessary with top-opening bags. To take the load off the zipper and to hold the load closer to the body, we provided three load-compressor straps. The side pockets are large (7 x 2.5 x 20") and have full-length zippers with two pulls to open either the side or the top.

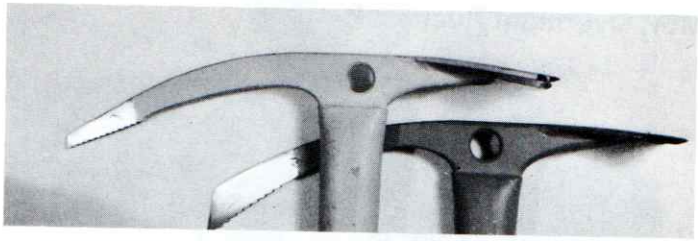
The standard bag is spacious, 12 x 15 x 24". The volume is adjustable by the load compressor straps from 4,320 cubic inches down to 1200 cubic inches. For medium loads, we supply a 25% smaller bag (9 x 15 x 24), 3,240 cubic inches to 1200 cubic inches. Specify if you want the medium size.

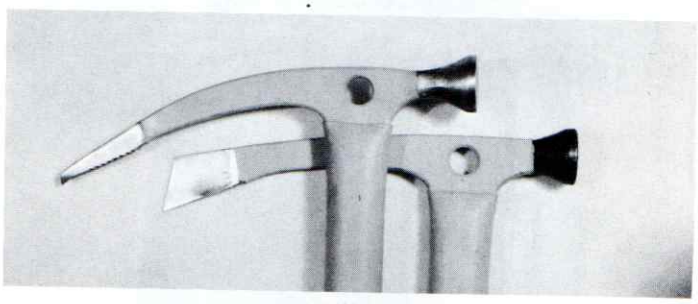
MSR Frame Pack, complete, unstrung, with cord and instructions, 3.9 lbs	#90-U	$49.50
MSR Frame Pack, complete, strung,	#90-S	54.50
Bag only, standard size, 2 lbs	#92	29.50
Bag only, medium size, 1.9 lbs	#92-M	29.50
Shoulder Straps, 8 oz/pair	#88	4.50

Note: For curiosity, observe the Co-op Summit Pack, p. 65 REI catalog. It has inside pockets which do not add to the volume of the pack. Further, their contents will be squashed by the contents of the main pack and even then will be difficult to remove. Ask the REI "Quality" Advisory Committee to check this out.

MSR Ice axes







THUNDERBIRD

The basic Thunderbird design for general Northwest climbing has served well, about 5000 of this model having been sold. Its self-arrest capability is excellent, due to its 68° hooking angle and positive clearance. The thickness of the pick is a full 1/4" for self arrest. (Note that the thinner picks of some European axes such as Nanga Parbat tend to slice through the snow without enough drag.)

The cleaving angle of the pick is 20°, which is good for chopping steps in ice and hard snow. The head is chrome-moly steel. The strength of the aluminum alloy shaft is distinctly higher than all wooden shafts. The head and shaft are coated with neoprene which grips much better against the snow in axe belay than slick vinyl (PVC) coatings. The coating is orange for visibility in bad weather.

Lengths: 18, 22, 26, and 29.5 through 37.5" by inch increments. 33.5" size with steel head weighs 2.0 lbs. With nylon wrist loop and glide ring.

T-Bird Ice Axe #101 $18.75

When six or more axes are ordered, any mix 17.75

Teeth can be added when wanted.

Add -T to number. $2.50 extra

ALL-ALUMINUM T-BIRD

90% of our Northwest climbers practically never chop steps in ice. Therefore, why carry the extra half-pound weight of head which is used only for ice chopping? Same shape, shaft strength and self-arrest capability as Item #101. The lesser weight is a joy. Tip of pick has hardened steel insert. Medium length weighs only 1 lb 6 oz. #201 $17.45

When there are 6 axes of any mix in the order 16.95

RUBBER GUARDS

All MSR axes are supplied with an adze guard because it seems silly to us to make a self-arrest with an unprotected adze close to the face. MSR Guards are thick and well-rounded soft rubber.

1. Glide Ring, Nylon Wrist Loop, 2 oz. #15-4 $1.95
2. Pick Guard for T-Bird, 1 oz. #131 .50
3. Pick Guard for Eagle and spike guard for all #130 .40
4. Adze Guard #132 .50
5. Neoprene Coating for renewing or thickening the coating on metal ice axes, 3-oz can with dauber orange or blue. #152 $1.95

Note: We think the red rubber head guard (REI AA46) is too flimsy. We tried to get Lagel (France) to make a thicker section of rubber as standard for better padding, but no interest.

EAGLE ICE AXE

The Eagle model has some changes based on feedback from ice climbers. The hole which required the hump has not been used for its intended purpose, so we now omit it. The cleaving angle has been narrowed to 8° for less breaking out of ice. The tip shape is optional, either chisel or point.

Eagle, without teeth,
specify chisel or sharp point #102 $19.75

Eagle, with teeth,
specify chisel or sharp point #102-T 22.25

SUMNER MODEL ICE AXE

Based on the T-Bird principle, Bill Sumner had us make a special model for ice climbers. The hook angle is 53° instead of 68°, and teeth are standard. The pick is thinner and the cleaving angle is narrower to permit socking the pick into hard ice with less fracture. The sharp point will hook into very hard snow and glacier ice with just a touch. Special hardened steel reamer spike can be used for boring shallow holes in ice for belay. Webbing thong instead of wrist loop. 20" long only. Blue.

1.5 lb #106 $28.95

This model available both from us and Sumner's climbing shop, The Swallows Nest, foot of 15th Ave. NE, Boat St., near north end of University Bridge.

MSR THUNDERBIRD-HAMMER

The Thunderbird-hammer is 20" long, including the normal spike. Extension shafts can be attached. This combination is ideal for mixed climbs which require a normal axe for self-arrest and axe belay at one time, and piton driving at another.

1 lb 12 oz #105 $19.75

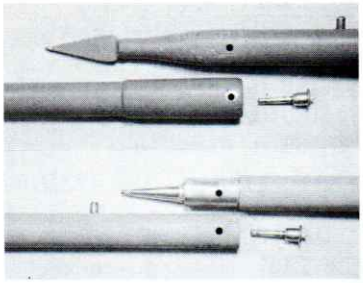
MSR EAGLE-HAMMER

Same as above, except for the pick. Eagle point can be sharpened for front-pointing.

1 lb 12 oz #104 $19.75

STOP SCREW

The early stop screws made by flattening a rod have given some trouble by breaking. Please send us an envelope marked "Stop Screw" and we will send you the new type using a collar. No need to send a letter or apply postage. No charge.



SHAFT EXTENSIONS

Existing short axes can be made longer by adding this removable extension. A 1/4" hole is drilled through the socket of the extension and the old shaft to receive a self-locking Quick-Pin. Specify how much longer you want your axe to be. Minimum increase is 7".

Wt 0.5-lb.

With installation instructions	#107	$11.75
Installed by us	#107-N	13.25

TAKE-APART ICE AXE

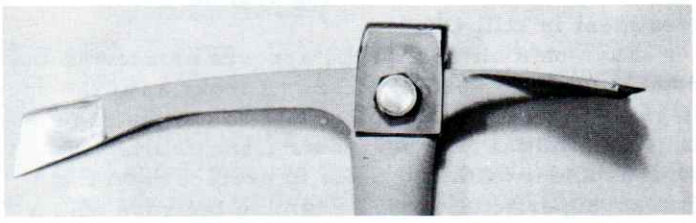
Made in two parts, the part with the head is a complete short axe. Joining the parts is simple, using a self-locking Quick-Pin which can be worked with gloves on. The short axe is standard 20" long; the total length as requested.

Add to the cost of the basic axe. # -TA $12.25

Conversion of Existing Axes to Take-Apart

You can do the work if you have a hacksaw and 1/4" drill. Parts and instructions. 4 oz #109 $10.75

Installed by us. Allow 5 days. #109-I 13.25

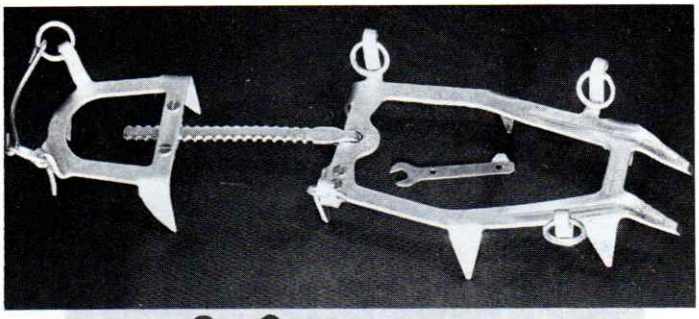


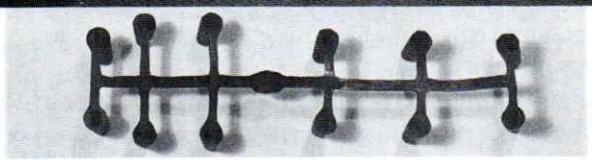
ICE AXE HAMMERING HEAD

The New Zealanders like to hammer both the pick and the shaft of their axes into hard snow and ice for anchors. This is hard on the regular MSR axes, so don't do it direct. We now offer a hammering head that can be attached to all MSR axes to avoid the damage that was done to the axes in New Zealand. Made of chrome-moly steel, this hammering head transmits the hammer blows without damage to the rivet. The shaft will peen after a while, but this can be filed smooth again. 4 oz #108 $ 3.50

Usual length of axe is measured from 1" below waist to floor.

20" = 51 cm	32.5 = 82.5
22 = 56	33.5 = 85
26 = 66	34.5 = 87.5
29.5 = 75	35.5 = 90
30.5 = 77.5	36.5 = 92.5
31.5 = 80	37.5 = 95





SALEWA 12-POINT ADJUSTABLE CRAMPONS

Bar connecting the halves is hinged at front part, thus avoiding the leverage on this bar that occurs on REI crampons when the boot flexes. Cadmium-plated hardened steel, checked by us for proper hardness. An adjustable crampon costs a bit more but is worth it for surefootedness on steep, hard snow and ice. Salewa Crampons come in four sizes: #84 $20.50
0, 1, 2, 3. Send outline of your boot.

CRAMPON GUARDS

Rubber point-caps to protect other objects in your pack. 12-point, wt 4 oz #86 $1.50/pair

CRAMPON HARNESS

Copied from Charlet Moser, this binding requires no threading of straps through rings in the field. This saves time and energy and decreases the temptation to remove gloves while putting on crampons. With ankle wrap for side-hill support. Neoprene coated nylon webbing. Attached using sliders; no tools required. 5 oz #262 $6.50/pair of crampons

Installed by us 5 oz #262-I 7.50/pair of crampons

CRAMPON WRAPPER

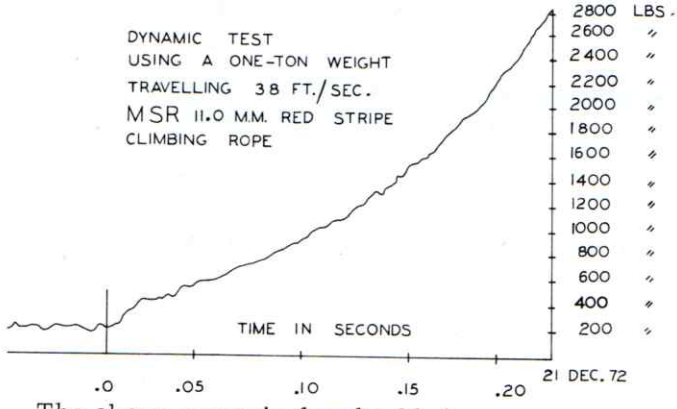
In new wet snow, crampons will clog. In May 1971, we discovered that nylon cloth wrapped around the crampon (perforated for the points and arms) will stop this clogging. Low in cost but an important safety idea. Close the ends with adhesive tape.

9" x 13", 4 oz/pair #83 $ .90/pair

MSR Climbing Ropes

MSR rope is kernmantel (braid-on-braid) construction, similar to kernmantel ropes from Europe; its only advantage over them is lower price.

The elongation curve is similar to that of Edelrid, a smooth upward curve. We think this is a good curve for absorbing the energy of a falling climber.



The above curve is for the 11.3mm rope we called 11mm last year. It was too strong, taking five UIAA falls instead of the required two. Its extra weight over Edelrid and Mammut was considered a disadvantage by climbers who had to carry it. So we reduced the weight 5% for rope received April '73 and after. The characteristic curve is very similar to that of the old rope except 5% less breaking strength and energy absorption. Still passes UIAA test.

MSR Climbing Rope

11mm, Red Stripe, 4.6 lbs/100 ft, Yellow-orange color with Red ends and center. Passes UIAA test. Processed for energy absorption. Nylon 6-6.

80 ft	3.7 lbs	#124-P	$17.60
120 ft	5.5 lbs	"	26.40
150 ft	6.9 lbs	"	33.00
165 ft	7.6 lbs	"	36.30

Unprocessed 11mm, with dyeing and hot-water-shrink instructions. Rope shrinks 15%.

94 ft becomes	80 ft	3.7 lbs	#124-U	16.00
151 ft "	120 ft	5.5 lbs	"	24.00
176 ft "	150 ft	6.9 lbs	"	30.00
194 ft "	165 ft	7.6 lbs	"	33.00
Any length,	4.1 lbs/100 ft		#124 per ft	.17

10.5 mm. Yellow-orange color, with Green ends and center, for moderate rock and glacier climbing.

	80 ft	3.6 lbs	#4-P	16.00
	120 ft	5.3 lbs	"	24.00
Processed	150 ft	6.7 lbs	"	30.00
Nylon 6-6	165 ft	7.4 lbs	"	33.00

Unprocessed 10.5 mm, with dyeing and hot-water-shrink instructions. Rope shrinks 15%.

94 ft becomes	80 ft	3.6 lbs	#4-U	$15.10
151 ft "	120 ft	5.4 lbs	"	22.65
176 ft "	150 ft	6.7 lbs	"	26.40
194 ft "	165 ft	7.4 lbs	"	29.10
Any length,	3.9 lbs/100 ft		#4-U per ft	.15

MSR 10 mm. BACKPACKERS and RAPPEL rope. White color with Blue ends and center. Unprocessed as sold except that it will shrink 7% the first time it gets wet and thereby gain better energy-absorbing properties. 3.3 lbs/100 ft as sold. Nylon 6.

85 ft becomes	80 ft	2.8 lbs	#3-U	$10.20
129 ft "	120 ft	4.3 lbs	"	15.50
157 ft "	150 ft	5.2 lbs	"	18.80
Any length,	3.3 lbs/100 ft		#3-U per ft	.12

Note: 10mm rope used in a Sticht link intended for 11mm rope will not have as much friction. It may be necessary to pass the rope through the link and then around the body to the control hand.

SLING ROPE

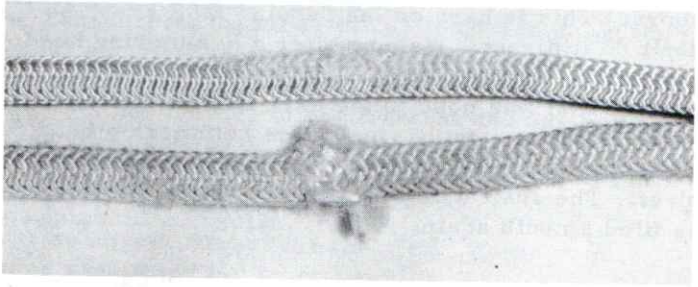
1/4" Braided Polyester cover over polypropylene core for low stretch. Beats twisted Goldline and manila all hollow for ease of use in prusiking. 1900 lb test on drums, 1200 lbs between figure-eight loops

Any length	0.3 oz/ft	#2	$ .11
Set of one 9.5-ft and one 10.5-ft length. Ends are melted by us.	6 oz/set	#1	2.20/set

ROPE COMMENTS

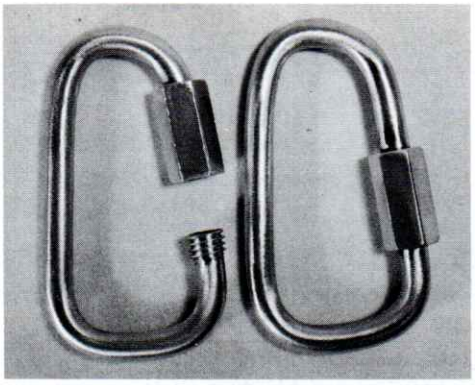
MSR ropes are dyed and heat-treated while chain "coiled". This makes them appear crooked at first, but this goes away with use. This also makes a few undyed spots, but think nothing of it because the heat-treatment is still OK.

Fuzz on a climbing rope appears as soon as the rope is dragged across rocks. It looks as if the rope is going to wear out fast, but this is not the case because the initial fuzz serves as a sheath over the strands underneath and tends to protect them from further superficial wear. Examine the rope with a 10x magnifier. When half of the filaments have been cut, the rope will appear very fuzzy indeed, but it still has 70% of its strength left. We suggest retiring the rope at that point.



The picture shows ropes which have been damaged by impact of a falling rock and by cutting over a sharp rock edge. Please do not think the rope was faulty in manufacture.

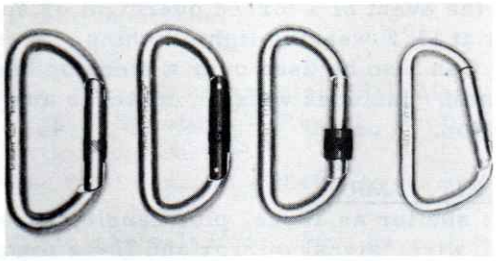
Wash your rope when it looks even a bit dirty. Use a washing machine at temperature less than 120°F. Spin and then air dry.



NEW MSR LOCK-LINK CARABINER

Lots of room for harnesses and ropes. The threaded lock nut slides up to make the opening. No swinging gate to jam against ropes already inside. Can be used with MSR Brake Bar and Sticht links. Outstanding for use with the Munter hitch. 5000-lb gate closed. 1000-lb gate open, but not intended to be used this way. The lock nut is hexagonal for grip. We have tried to cause a running rope to open it, but couldn't. The rope rides on a flat and doesn't get a grip. Aluminum rod with forged ends.

Plain	2 oz	#205	$ 2.75
Anodized blue	2 oz	#205-A	$ 3.25



BONAITI 12.8mm. Closed 7000 lbs, open 2900 lbs. Heavy duty. Passes UIAA test. Does not fit brake bar. 3.2 oz. #128 $ 2.60

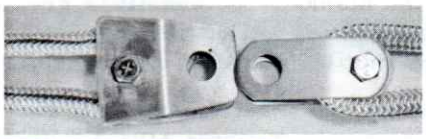
BONAITI SPECIAL. Regular D-shape with 11mm rod body and 12mm rod gate. We proposed this use of a heavier gate to Bonaiti in 1969, and the result is a stronger carabiner, including transverse loading. 2.3 oz. 5000 lbs. #127 $ 2.25

Five for $9.75. Ten for $19.00.

BONAITI LOCKING SPECIAL. Same as Special, plus lock ring. #129 $ 2.60

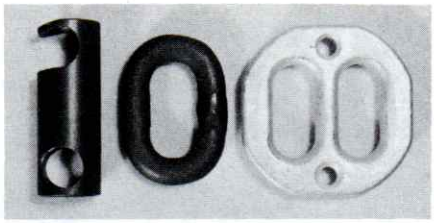
NEW BONAITI SLANT-D. The gate is slanted for instant location of the opening. Same heavier-gate feature. 2 oz. 5000 lbs. # 80 $ 2.25

Five for $9.75. Ten for $19.00



NEW MSR RESCUE PULLEY. Wide side plates to keep the rope from abrading against the rock and to help prevent the pulley from rotating and twisting the hauling rope. Wheel groove .950". 4000 lbs. 1.6 oz. # 206 $ 2.65

MAGNUSSON RESCUE PULLEY. Narrow sides, .750" groove, 4000 lbs. 1.4 oz. #58 $ 1.75



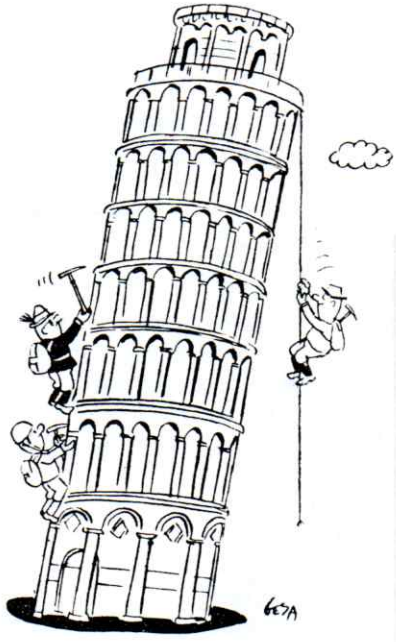
MSR BRAKE BAR. Tubular aluminum. The big advantage of our brake bar over REI/SMC is that the hole is big enough to allow the bar to be moved around to the solid side of the carabiner ready for instant use without fumbling or danger of dropping. This also allows the bar to be self-aligning without leverage on the gate if jammed. See article in Off Belay, Feb. '73, showing this leverage.

Plain	1/2 oz	#27	$ 1.45
Anodized Red	1/2 oz	#27-A	$ 1.65

STICHT LINK

The Sticht Link is a modern method of absorbing the energy of a fall or rappel, far more capable and comfortable than hip and shoulder belays and Dulfersitz rappels. Use with 10-11mm kernmantel nylon ropes (not 3-strand twisted). Instructions included. MSR single links. One is enough for single-line rappel or belay. Two can be used on two-rope rappel. Aluminum.

Plain	1 oz	#69	$ 1.25
Anodized Red	1 oz	#69-A	$ 1.50
Double hole aluminum plate for either single or double use.	2 oz	#70	$ 2.60



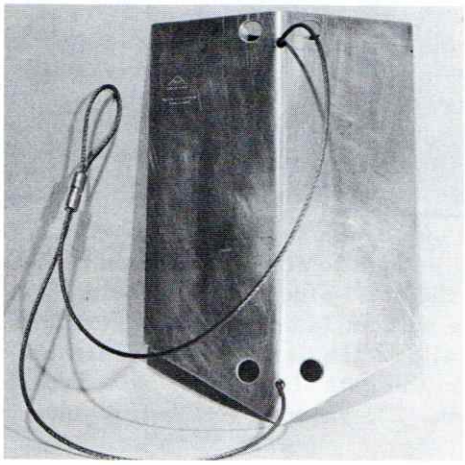
DESCENDING & HARNESS RING

Chrome-plated steel, 1.75" OD, 4000 lbs test.
1.1 oz #29 $.35

ROCK AND RAPPEL GLOVES

Lightweight, flexible with sprayed-rubber surfaces for excellent grip, to prevent cuts and scratches and for friction on rappel and link-assisted belay. Porous for comfort. Will last 2 or 3 days of rock climbing. 3 oz. M, L, XL #62 $ 1.50

MSR Snow Flukes



The MSR Snow Fluke is a dynamic snow anchor which can "sail" down into the snow on overload.

It travels along under the surface, absorbing the energy of a fall as it goes. Thus, it does not exceed the strength of the snow and is not pulled out as is the case with an overloaded ice axe anchor. It has two cables which fix the angle, to keep the plate from tilting forward and flying out.

The holes allow the fluke to be lashed to an ice axe for use as a shovel.

4 x 7"	for hard snow only, 7 oz.	#11	$6.50
5 x 10"	for firm summer snow, 11 oz	#12	6.50
8 x 12"	for medium soft snow, 16 oz	#13	7.50

Note: We tested having a pounding bar on the top of the fluke but found it impeded the flight of the fluke into the snow, thus increasing the chance of pullout.

Caution: The 8 x 12" size should be used in softer snow but obviously will not restrain much in very soft snow. Test: one man can pull about 70 lbs downhill with his hands on the rope. If seven can just move the fluke, the restraint is about 500 lbs, which is a useful holding force.

Caution: If the snow has a breakable crust with soft snow below the fluke, the cables will ride up over the crust and pull the fluke out. Clear away the soft snow to firm snow. . . . Stomping the surface of soft snow helps very little. . . . If there is an ice layer down say one foot, the fluke cannot sail through it and may pull out. Test the strength of the lower layers by probing with your ice axe.

IGLOO TOOL

Building Igloos is a lot of fun and useful in survival. When we first learned a few years ago, the block-cutting tools were machetes and big power-hacksaw blades. They caused too many cut hands so we devised this tool which is safer. Made of springy aluminum, with tooth clearance and side-set, useful in harder snow. Mahogany handle.

With diagrams. 7 oz #34 $5.50

Health

MOLESKIN WITH ADHESIVE FOAM

1/8" thick for padding around blisters. For example, if you have a blister on the back of the heel, apply a full-height (to the top of the shoe) 1.5" wide patch leaving a gap or a cut hole where the blister is. Never apply on the blister itself because that will only increase the pressure and pain.

A special price. We were going to use this in our helmets and then changed. Limited supply.

6" x 25" 3.5 oz #230 $1.00

STORM SHELTER, TMRU

The Tacoma Mountain Rescue Unit developed this efficient shelter, a yellow plastic-film tube, 80" circumference x 96" long, one mil thick. Light in weight (5 oz) it should be in every summit pack to aid survival in the event of a forced overnight or storm. We tested it at 13°F wearing light clothing. It really works. Can also be used over a sleeping bag for extra warmth. Includes whistle, matches and survival information. 5 oz #46 $1.00

STORM KIT, TMRU

Contains shelter as above, plus candle, sugar, tea, bouillon, wire, signal mirror and 12-oz metal cooking can. 11 oz #45 $2.00

STORM SHELTER & BIVOUAC TENT

Similar to TMRU shelter above except thicker (1.5 mil instead of 1.0) and longer. More durable for use also as bivouac tent. 8' long 7 oz #231 $1.60

Same except 12' long. Can be used by two persons for bivouac, feet overlapping for warmth. With whistle, matches and instructions. 10 oz #232 $2.00

Rescue Blanket--Aluminized Plastic, REI-MA45

The aluminized surface is supposed to reflect heat back onto your body, which it does. But heat is lost at body and outdoor temperatures more by conduction and evaporation than by radiation. If air can circulate under the blanket, the benefit is greatly reduced. Hence, one major defect of this blanket is that it is too small to shut off the wind completely.

We tried taping two sheets together to make a tube of the same size as the Tacoma MRC yellow tube shelter. Then it works, but not appreciably better than the MRC shelter which costs much less.

There are then two other defects. When the material has been cut or punctured, the cut will continue to tear easily, like cellophane. A minor defect is that the material is noisy when ruffled by body movement or wind.

Survival - - - - - Rescue

HAND WARMERS

Charcoal stick type. We recommend you carry two for comfort and emergencies. In the event of an accident, ten or more of these will really help prevent chill or hypothermia of the victim, given a bit of shelter. Will not operate inside a plastic storm shelter without ventilation. We checked these out for carbon monoxide, and found very little. The sticks give off a mild odor while burning. 3 oz #190 $1.35
Box of 12 Fuel Sticks 6 oz #191 $1.00
Note: We have checked out eight different handwarmers and believe this model is the simplest and smoothest in operation. The lighter fluid types give off annoying unburned hydrocarbon vapor and are variable in heat output according to how hot they are. They tend to "run away", because the hotter they are the more fuel vaporizes.

SALT TABLETS

In Reprints, there is an article, "Salt Management During Profuse Sweating." Repeat, Profuse. Some of its practical comments:

1. The first quart of sweat gets its salt from food.
2. Don't take salt if you don't have water. Drink 8 oz water per tablet.
3. Don't take lots of water if you don't take salt.
4. Use wax-impregnated tablets to avoid stomach distress. White tablets dissolve too fast and can be upsetting.
5. If you have been exercising with sweating regularly, your need for extra salt decreases.

Wax Salt Tablets, 0.5 grams salt/tablet,
50-tablet cans #177 $ .60

COMPASS

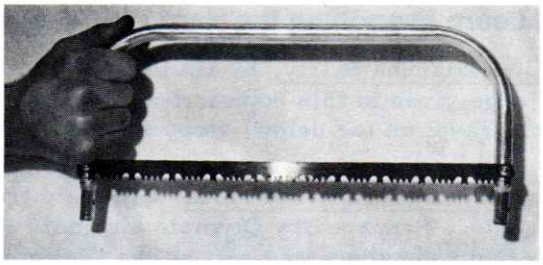
This Wilkie Compass is simple but of high quality. Brass case, highly magnetized needle. Not liquid filled; needle can be damped by tilting the case.
Very light weight, 0.3 oz. #234 $1.25

GRADUATED BEAKER

Lighweight plastic beaker graduated in ml for measuring urinary output. 250 ml. Minimum suggested by doctors is 1000 ml. per 24 hours. 1 oz #233 $ .70

BUTANE LIGHTER

A butane cigarette lighter is an excellent fire-starting aid in bad weather, especially when used with the 2" metal extension tube which we supply with the lighters we sell. After a bit of wood is burning, add the extension to feed butane gas into the center of the tinder. Lighter with tube, 1 oz, plus 4 oz butane refill. Refill your lighter before every trip. #188 $3.75



WOOD SAW

Many times the only available wood is too big for cutting with a knife. This Sven-saw type of blade fits the top-bar of MSR packs. It has served well: it has made a crude ice axe for a climber who lost his axe, litter poles for a climber with a sprained ankle, and cut firewood at the scene of an accident.
15" Saw, with bolts 1 oz #207 $1.10
Frame with blade, 5" cutting depth 4 oz #208 $3.50

AVALANCHE PROBE

Light and rigid. Jointed alloy aluminum tubing 18" long x 7/16" diameter. Bends much less than steel probes which weigh three times as much. Probe end is .015" larger than tubing to decrease friction. With sack for 12 sections,
#179-P Point Section #179-X Extension $2.65/ea

CITIZENS BAND RADIO

Johnson Messenger 109 3-watt Transceiver. This radio is at the top of the quality list of the sets we tested. High clarity of speech increases the effective range of this set in comparison with other sets which have a higher rated power. Light wt, 2 lbs. Detachable battery pack which permits carrying an extra set without having to reload in the field. In cold weather, the extra set can be kept warm under the jacket and exchanged as needed. Rechargeable nickel-cadmium, rechargeable alkaline pen cell, and regular alkaline pen cell battery packs available. Write for bulletin.

Johnson 109 Transceiver, with Ni-Cad pack & charger, 2 lbs #279 $160.00
Same, with pen cell pack, cells not included 1 lb #280 130.50
Leather Case made by Johnson, 8.7 oz #281 8.95
Ethafoam Case by MSR, not elegant but better padding and lighter for field use. No strap. 1.2 oz #282 3.50
Alkaline Penlite Cells, Size AA, 2 oz #283 $2.00 two per card. (8 req'd per pen cell pack)

Don't Learn Everything the Hard Way — Read!

ABC of Avalanche Safety, by Dr. Ed LaChappelle. Knowledge given in this book is a safety essential for all who travel on (or below) steep snow slopes.
#50 $ .95

Climbers Guide to the Olympics, complete trail and peak guide. Prepared by Olympic Mountain Rescue, who really know their way around the Olympics. 223 pages. #193 $ 4.25

Frostbite, by Washburn. Frostbite is an everpresent danger in cold weather; every hiker, skier and climber who goes out in freezing weather should read this book. pages. #48 $ 1.00

High Trails: Guide to the Pacific Crest Trail--Washington, by Louise Marshall, noted hiker and writer (editor of The Signpost). She writes from the experience of hiking all parts of the PCT-W. Includes reference to access trails. Two volumes: North; and South.
#197-N $ 2.50
#197-S $ 1.00

Medicine for Mountaineering, Dr. James Wilkerson. This is a real textbook (309 pages) of intermediate medical information written for climb leaders who must take over in the event of accident and illness. Goes well beyond first aid. #192 $ 6.50

Mountaineering First Aid, by Dick Mitchell, founder of the First-Aid Committee of The Mountaineers. A thorough practical book by an active skier and mountaineer. He has earned the rating, Emergency Medical Technician. Newly written, 96 pgs. #199 $ .50

Mountaineering Medicine, Darvill. Compact to carry in your first aid kit. 38 pages. 6th Edition.
#65 $ 1.00

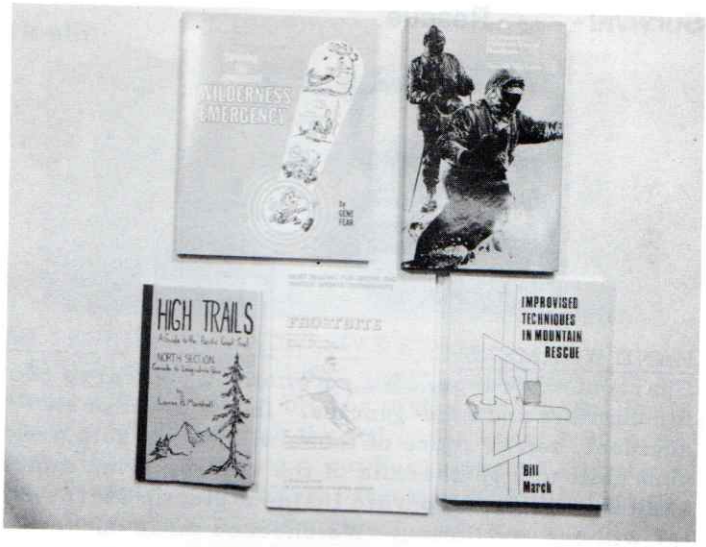
Mountain Search and Rescue Operations. This little book is filled with practical advice on search and rescue, with extra emphasis on planning, organization and training. Not 100% up-to-date (1958), but it has had six printings and is well worth reading. By Grand Teton Assn. 87 pages. #196 $ 1.00

Mountain Search for the Lost Victim, by Dennis Kelley, Montrose Search and Rescue. A full examination of the problems and techniques of search, based on years of experience. 283 pages.
#290 $ 3.95

Venomous Bites, Summary leaflet #187 $ .25

Outdoor Living--Problems, Solutions, Guidelines
By Tacoma Mountain Rescue Unit. Excellent source book for teachers and leaders in cold, wet, and hot environments. 108 pages. # 64 $ 2.30

Trees, Shrubs and Flowers in Washington, Lyons.
When the going gets too rough, relax and smell the flowers. 211 pages. #63 $ 3.70



Cascade Alpine Guide - South. Fully revised, just off the press. By Fred Beckey. Covers from the Columbia River to Stevens Pass. Now you can find your way up the right side of the mountain or at least know when you are lost. #194 $ 9.95

Wilderness Emergencies (Surviving the Unexpected). This is the best book on survival we know. Well written, by Gene Fear, Survival Education Assn. Gene is a well-known Northwest outdoorsman/Mountain Rescue team member. An excellent source and guide book for leaders and teachers, and also for all persons going into the mountains and deserts. Makes an excellent, permanent gift.
Paperbound #198-P $ 3.25
Clothbound #198-C $ 5.75

International Mountain Rescue Handbook, by Hamish Mac Innes, Scottish Mountain Rescue. All leaders should read this book, whether active in rescue or not. Contains much mountaineering information in addition to rescue techniques. 218 pages
#291 $ 9.50

Improved Techniques in Mountain Rescue by Bill March, Scottish Mountain Rescue. A very practical book filled with procedures a climbing party can use before outside help can arrive. 94 pages.
189 $4.50

Hypothermia--Killer of the Unprepared by Dr. Ted Lathrop. More lives are lost in our mountains by getting too chilled than by accidents. Read this book and follow its advice. 1972. 23 pages #44 $ 1.00

MAGAZINES

Off Belay is edited by Ray Smutek, an engineer. He is doing a creditable job, devoting more space to technical articles than to how someone climbed the East Buttress of something or other. If you are interested in mountain technique and safety he deserves your support. Send $6 for a one-year subscription to Off Belay. 12416-R, 169th S. E., Renton, WA 98055. ($11, 2 years; $15, 3 years.)